

Appendix A

[0012] The present invention overcomes these and other drawbacks by providing a method and apparatus for allocating bandwidth at a network element. According to one embodiment, packets in a PHB are metered to see if they fall within a committed information rate for that PHB. Packets that are within the Committed Information Rate (CIR) for the given PHB are colored green. Packets that are outside the CIR are metered by a surplus information rate meter, which is used to meter commonly excess packets from the PHBs configured to be output over that port or logical port. As used herein, the term "port" will be defined as including both physical and logical ports. Many types of logical ports exist, such as Frame Relay Data Link Connection Identifiers (DLCIs), Time Division Multiplexing (TDM) channels, Virtual LANs (VLANs), bundles of flows, link aggregations, and numerous other types of logical associations of bandwidths or logical apportioning of bandwidths. The term port is thus not limited to any particular type of logical port. By metering the surplus packets together on a per-port basis it is possible to ensure fair treatment to the PHBs while not over-committing network or network element resources. By using a common meter to meter packets falling outside their PHBs' committed information rates, it is possible to allow packets from multiple PHBs to share the surplus bandwidth on a port equally as needed, while not allocating bandwidth to PHBs that do not have a need for use of the surplus bandwidth.

[0036] The ingress network processor 38 also determines the information needed by the switch fabric to carry the packet to the correct egress point. For example, the ingress network processor may ascertain the ~~SAP, PID~~ (slot address and subaddress), and the physical egress port to which the packet is to be routed/switched. Optionally, the ingress network processor may determine and record the egress queue ID as part of the lookup process and pass it to the egress processor (discussed below) to further facilitate end-to-end QoS.

[0061] During operation, each classful meter maintains the number of octets (or token counts) that are currently associated with the SIR parameter and each of the individual CIR parameters. The value of the token count that is associated with the SIR parameter is represented using the notation T_s . The value of the ~~token count~~ Token Count (TC) that is associated with each CIR[phb] will be represented using the notation TC[phb].